aeroqual™

Portable Air Quality Monitors

aeroqual.com

Portable air quality monitors

Aeroqual's portable air quality monitors are tools for air quality professionals and enthusiasts alike to gather real-time information on the surrounding air. They are a flexible air quality monitoring solution that can be configured with 27 different gas sensors and particle sensor for a range of uses from environmental monitoring to industrial applications.

What can it measure?

- Criteria pollutants (WHO, EPA, EU)
- Indoor pollutants
- Industrial gases
- Particulate matter (PM_{10}, $PM_{2.5}$)
- Temperature and Relative Humidity

What can it be used for?

- Short term air quality studies
- Checks on pollution "hot spots"
- Site air quality surveys
- Personal exposure assessments
- Short term fixed monitoring

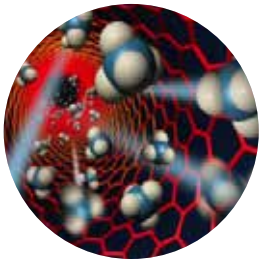
28 inter-changeable sensors

Customizable to a variety of applications

Designed for outdoor performance

GSS technology for ppb level measurements

Real-time data capture



Part-per-billion gas detection in ambient air

Traceable factory and field calibration

US EPA Highlighted

In the EPA 2014 Air Sensor Guidebook featuring low cost air sensors, Aeroqual's Series 500 was highlighted for our ozone, nitrogen dioxide, and carbon monoxide sensors.

Easy as 1-2-3

Our portable air monitors are designed to make ambient air quality monitoring easy as 1-2-3. They are used by researchers, professionals, and non-experts alike to gather indicative air quality data. Small enough to fit comfortably in the hand, they can be used anywhere – indoors or outdoors, on the street, up a mountain, they've even been used in Antarctica!

Step 1

Gather data

Use the monitor and inter-changeable sensors to take spot measurements, or log data over time and space.

Step 2

Download data

Connect to a PC and download your measurements using Aeroqual's free software or 0-5V analog output.

Step 3

Analyze data

Analyze your data to identify trends, discover leaks or pollution hotspots, or dive deep into the numbers for research.

Monitor functions

The monitor base is an electronics platform with an ergonomic design into which you plug your chosen sensor head(s). The monitor base has a range of features that allow it to be used in a variety of different applications. The image and functions shown below are for the Series 500 monitor. For a comparison of the different monitor bases see page 22.

Interchangeable sensor heads

Field replaceable long life lithium battery

Minimum, maximum and average readings

Measurement units ppm or mg/m³

Zero calibration

Location and Monitor ID

Span calibration

0-5V Analog output

External transistor outputs

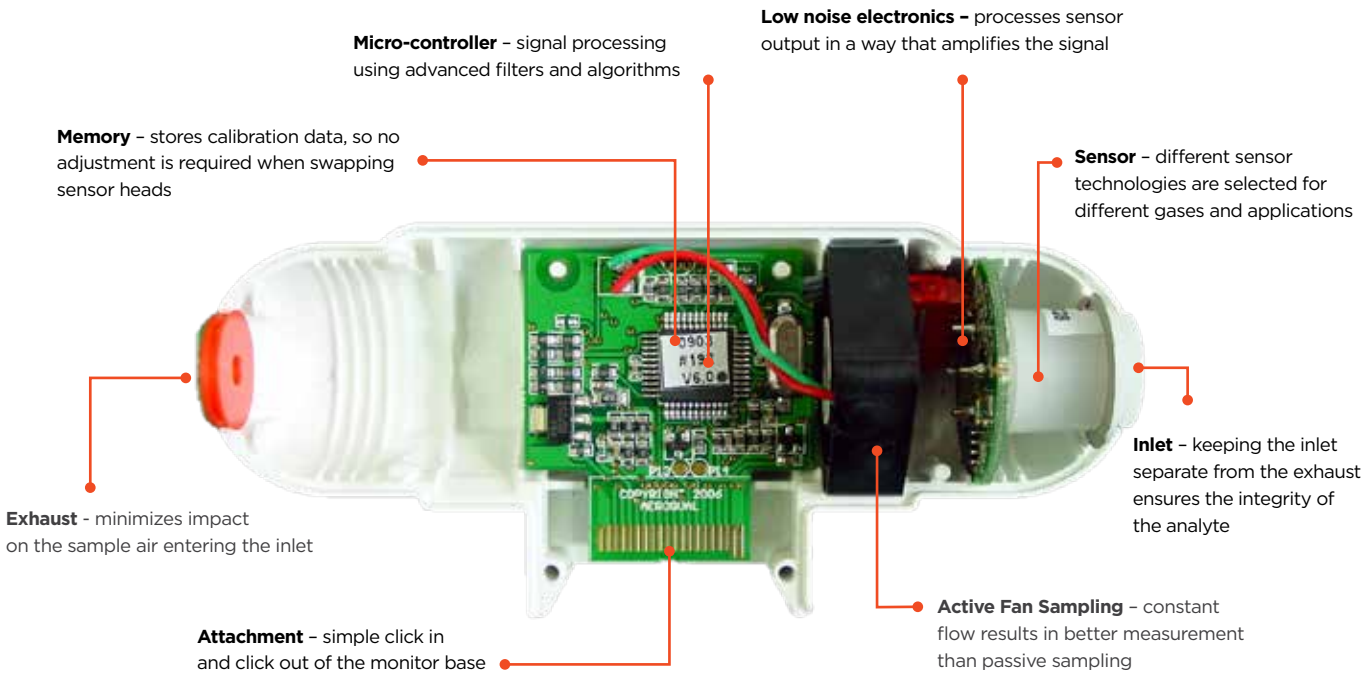
High and low alarms

Data logging

Aeroqual Software

Sensor heads

Sensors are housed within an interchangeable 'sensor head' that attaches to the monitor base. You can choose from up to 27 different sensor heads. Each sensor contains a single gas or particle sensor. Swapping sensor heads takes seconds and no configuration or re-calibration is required.



Right tool, right job

Aeroqual uses a mix of sensor technologies; we select each one based on rigorous testing and depending on the target pollutant and application.

SENSOR TYPE*	DESCRIPTION	PARAMETERS	SENSOR
GSS	Our gas sensitive semiconductor (GSS) sensor uses proprietary sensing material, built in automatic baseline correction (ABC) and interference rejection. This combination results in ppb resolution and a highly linear response.	Ammonia, Carbon monoxide, Hydrogen, Methane, Ozone, Perchloroethylene, VOC	
GSE	Our gas sensitive electrochemical (GSE) sensors generate nano-amp currents proportional to the gas concentration. Aeroqual uses low noise electronics to capture these signals resulting in low detection levels.	Ammonia, Carbon monoxide, Chlorine, Formaldehyde, Hydrogen sulfide, Nitrogen dioxide, Ozone, Sulfur dioxide	
LPC	Our laser particle counter (LPC) for Particulate Matter (PM) measurements uses optimized signal processing using low noise electronics, we add algorithms to correct for interferences, e.g. humidity.	Particulate Matter	
NDIR	Our non-dispersive infrared (NDIR) sensor uses infra-red light, a narrow band-pass filter and photodiode to measure the intensity of light at the gas absorption band. The light intensity is proportional to the gas concentration.	Carbon dioxide	
PID	Our photoionization detector (PID) sensor uses a krypton filled UV lamp to ionize VOC gas molecules and generate a current that is proportional to the VOC concentration. The PID sensor responds to a wide range of VOCs and is industry recognized.	VOC	

*All sensors in the portable range benefit from active sampling and come factory calibrated.

Applications

Over the last 15 years we have made and delivered more than 10,000 portable monitors. The applications below are just some of the ways in which our customers put their monitors to use.

Indoor air quality

Indoor air features a range of pollutants that can be very different to those found outdoors. Aeroqual portable monitors can be used indoors and outdoors for applications ranging from air quality monitoring, health and safety, or process control.

PM_{10} $PM_{2.5}$ O_3 CO_2 CO VOC CH_2O

Construction dust and emissions

Construction and remediation activity can have significant impact on local receptors, over and above general urban pollution levels. The portable monitor can be used to spot check PM, NO_2 and VOCs around construction sites.

PM_{10} NO_2 VOC

Transport emissions

In most cities transport emissions are a major contributor to urban air pollution. Pollution from mobile sources (on and off road vehicles, ships and aircraft) often includes CO, PM, NO2, and VOCs.

$PM_{2.5}$ PM_{10} NO_2 CO VOC

Smog monitoring

Smog formation and distribution can be challenging to model and predict. Ozone and $PM_{2.5}$ are the primary pollutants; the contributing pollutants are NO_2 and VOC. Portable monitors sampling a wide area can gain new insight into smog patterns.

$PM_{2.5}$ O_3 VOC NO_2

Air quality model validation

Validating air quality models is complex, affected by scale and the micro-environment. Methods such as diffusion tubes may provide spatial accuracy but temporal precision is forfeited. Taking real-time measurements, Aeroqual portable monitors overcome these limitations.

$PM_{2.5}$ PM_{10} O_3 NO_2 SO_2 VOC H_2S CO

Community exposure studies

Pollution exposure varies widely within a city depending on pollution sources, meteorological effects and topography. Aeroqual portable monitors offer community groups cost-effective tools for measuring a wide range of pollutants in a robust and defensible way.

$PM_{2.5}$ PM_{10} O_3 NO_2 SO_2 VOC H_2S CO

Particulate Matter

Why measure it?

Airborne particulate matter (PM) is categorized into different size fractions. Total Suspended Particulate (TSP) includes all particle sizes and is a good measure of nuisance dust. PM_{10} (particles ≤ 10 microns) is a criteria pollutant and is a serious health risk because PM_{10} particles can penetrate the lungs. $PM_{2.5}$ (particles ≤ 2.5 microns) is also a criteria pollutant which has even greater health impact due to risk of penetration deeper into the respiratory system. Research has linked particulate pollution to lung and heart disease, strokes, cancer, and reproductive harm.

Where does it come from?

Natural sources

Large particles (generally PM_{10} and above) come from natural sources stirred up by wind or human activity. PM_{10} occurs naturally; for example, as sea salt, dust (airborne soil), or pollen. Airborne soil particles, although natural, are also produced by human-made processes such as construction and industrial activities. Natural particulates can make up a large portion of PM_{10} in some areas.

As a pollutant

Small particles (generally $PM_{2.5}$ and below) are by-products of combustion, e.g. emissions from vehicles and power stations. Particles from these sources react with other gases in the atmosphere to create particles of various chemical compositions. Gas to particle conversion can also produce fine particulate.

How we measure it

In the portable monitor range we use a laser particle counter (LPC) for its small size and portability.*

Like all sensors in the portable range the PM sensor benefits from active fan sampling and comes factory calibrated.

PARTICULATE MATTER	SENSOR CODE	SENSOR TYPE	RANGE (mg /m³)	MINIMUM DETECTION LIMIT (mg /m³)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (mg /m³)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
($PM_{2.5}$) (PM_{10})	PM	LPC	0.001-1.000	0.001	±0.005 mg/m³ + 15%	0.001	5	0 to 40°C	0 to 90%	✓	✓	✓

*Refer to table on page 4 for sensor technology description.

Ammonia

Why measure it?

Ammonia gas (NH_3) is made up of nitrogen and hydrogen atoms. Ammonia is a toxic gas which can cause burning in the respiratory tract when inhaled. It also has a distinct odor which can become a nuisance for those nearby emission sources.

Where does it come from?

Natural sources

Ammonia is an important compound in many biological processes and is a key part of the nitrogen cycle. It occurs naturally at trace concentrations in the atmosphere mainly from the decomposition of organic matter but is also used in industrial processes. It is a basic compound and reacts with acidic gases (such as NO_2 and SO_2) in the atmosphere to form secondary aerosols (fine particles).

Agricultural sources

Ammonia emissions are primarily from animal agriculture. In particular, livestock and poultry operations where it is a common by-product of animal waste. Fertilizer use also generates ambient NH_3.

Industrial uses

Ammonia is used in the manufacture of several products including plastics, textiles and pesticides as well as in the fermentation industry and as an antimicrobial agent. It is emitted from vehicles fitted with 3-way catalytic convertors. It is used in industrial refrigeration systems which are usually fitted with NH_3 leak detectors for health and safety. It is also found in many household and industrial strength cleaning products, although NH_3 solution (NH_3 dissolved in water) does not cause high enough NH_3 concentrations to be harmful to health.

How we measure it

In the portable monitor range we measure ammonia using an electrochemical sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Ammonia (NH_3)	NH	GSS	0-1000	2	<±5 ppm +15%	1	30	0 to 40°C	10 to 90%	–	–	✓
	ENG	GSE	0-100	0.2	<±0.5 ppm + 10%	0.1	120	0 to 40°C	15 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

Carbon Dioxide

Why measure it?

Carbon dioxide (CO_2) is a naturally occurring gas which acts as the primary source of carbon in life on Earth. It is also a primary greenhouse gas; carbon dioxide absorbs and emits infrared radiation causing warming of the Earth's surface and lower atmosphere. Indoors, elevated levels of CO_2 can lead to drowsiness, headaches as well as a reduction in productivity.

Where does it come from?

Natural sources

In the carbon cycle, carbon is released into the atmosphere from various sources and absorbed again in natural sinks (reservoirs). Humans and plants give off carbon dioxide through respiration, making them a source of CO_2. Plants absorb CO_2 during photosynthesis, making them a sink. The ocean acts both as a source and a sink, releasing CO_2 and absorbing it through natural processes. Volcanic eruptions act as a natural source of CO_2.

Industrial sources

Since the industrial revolution there has been a significant increase in atmospheric carbon dioxide due to human activity. The main sources of CO_2 gas include electricity generation, transportation, and industrial processes which all involve combustion of fossil fuels. The increase in atmospheric CO_2 has been shown to cause changes in the global environment including climate change and ocean acidification.

Indoor sources

People are the main source of carbon dioxide emissions in indoor environments due to CO_2 being the main gas emitted during respiration. The higher the number of occupants in a building space, the higher the concentration of CO_2. Most heating, ventilation and air conditioning (HVAC) systems re-circulate indoor air leading to increasing CO_2 concentrations. It is therefore important to measure indoor CO_2 to ensure healthy levels are maintained.

How we measure it

In the portable monitor range carbon dioxide is measured using a non-dispersive infrared (NDIR) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Carbon dioxide (CO_2)	CD	NDIR	0-2000	10	<±10 ppm + 5%	1	120	0 to 40°C	0 to 95%	✓	✓	–
	CE	NDIR	0-5000	20	<±20 ppm + 5%	1	120	0 to 40°C	0 to 95%	–	✓	✓

*Refer to table on page 4 for sensor technology description.

CO

Carbon Monoxide

Why measure it?

Carbon monoxide (CO) is a toxic, odorless gas. If inhaled it will displace oxygen from the hemoglobin molecule in our blood and lead to severe disability or even death. It is one of the 'criteria' pollutants measured in ambient air.

Where does it come from?

Outdoor sources

Carbon monoxide is found naturally at low concentrations in the atmosphere from volcanic activity and forest fires. CO is produced from the partial oxidation of carbon-containing compounds in situations where there is not enough oxygen present to produce carbon dioxide. The main source of outdoor CO is combustion processes from transportation and industrial activity.

Indoor sources

Malfunctioning fuel burning appliances such as furnaces, cookers, water boilers and gas room heaters can all lead to carbon monoxide leaks in areas occupied by people.

Industrial uses

Carbon monoxide is very important in industry since it is a precursor to a number of important organic chemicals. CO gas has various niche applications in the chemical, food, medical, and semiconductor industries.

How we measure it

In the portable monitor range we measure carbon monoxide using either a gas sensitive semiconductor (GSS) sensor or a gas sensitive electrochemical (GSE) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Carbon monoxide (CO)	ECM	GSE	0-25	0.05	<±0.5 ppm 0-5 ppm <±10% 5-25 ppm	0.01	60	0 to 40°C	15 to 90%	✓	–	–
	ECN	GSE	0-100	0.2	<±1 ppm 0-10 ppm <±10% 10-100 ppm	0.1	30	0 to 40°C	15 to 90%	✓	✓	✓
	CO	GSS	0-1000	1	<±2ppm + 15%	1	30	0 to 40°C	10 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

Chlorine Gas

Cl_2

Why measure it?

Chlorine gas (Cl_2) has a familiar odor due to its use in household bleach and in public swimming pools. Cl_2 is a highly reactive gas and therefore combines easily with other elements. High levels of Cl_2 gas can lead to coughing and chest pain as well as irritation and respiratory damage. It is a heavy gas and therefore will accumulate at the bottom of poorly ventilated spaces. There is a risk of explosion if high concentrations of the gas come into contact with flammable materials.

Where does it come from?

Natural sources

In nature, chlorine is too reactive to be present as a gas. Instead it is found in the form of ionic solids such as sodium chloride (common salt) and does not pose a health threat. Chlorides make up much of the salt dissolved in the earth's oceans; about 1.9 % of the mass of seawater is chloride ions.

Industrial uses

Chlorine is widely used in the production of consumer goods such as plastics, solvents for dry cleaning and metal degreasing, textiles, antiseptics and household cleaning products. The greatest risk to workers is from Cl_2 leaks.

Chlorine is an important chemical used in water sanitation as it is capable of killing bacteria and other microbes present in water. It is commonly used to clean drinking water, waste water and public swimming pools.

How we measure it

In the portable monitor range we measure chlorine gas using a gas sensitive electrochemical (GSE) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Chlorine (Cl_2)	ECL	GSE	0-10	0.01	<±0.02 ppm + 10%	0.01	30	0 to 40°C	15 to 90%	✓	–	✓

*Refer to table on page 4 for sensor technology description.

Formaldehyde

CH_2O

Why measure it?

Formaldehyde gas (CH_2O) is a flammable gas that enters the atmosphere through natural sources such as forest fires, by direct human activities, and via reactions between other compounds in the atmosphere. It is commonly sold commercially as a 30% solution in water for preservation purposes. It has a pungent irritating odor. CH_2O in all its forms is highly toxic to all animals. Occupational exposure is mainly via the inhalation of vapors and can be known to cause headaches, difficulty breathing and burning in the throat.

Where does it come from?

Natural sources

Most formaldehyde found in the environment is a result of processes taking place in the upper atmosphere. It is an intermediate gas which is produced during the oxidation of methane and can be used as an indicator of anthropogenic pollution and biomass burning. It does not accumulate in the environment as it is easily broken down by sunlight.

Industrial uses

Formaldehyde is a precursor to more complex compounds used in several industrial applications. It is commonly used in resins for the manufacture of composite wood products and plastics. CH_2O solution is used as a disinfectant to kill most bacteria and fungi and can also be used to preserve tissues or cells for scientific analysis. CH_2O enters the body through inhalation.

How we measure it

In the portable monitor range we measure formaldehyde using a gas sensitive electrochemical (GSE) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Formaldehyde (CH_2O)	EF	GSE	0-10	0.01	<±0.05 ppm 0-0.5 ppm <±10% 0.5-10 ppm	0.01	30	0 to 40°C	15 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

Hydrogen

Why measure it?

Hydrogen (H_2) is odorless, tasteless and colorless, so leaks are very hard to detect. Hydrogen can be hazardous to human safety as it is a highly flammable gas when mixed with air.

Where does it come from?

Natural sources

Hydrogen is the most abundant chemical substance in the universe. However, pure hydrogen gas (H_2) is scarce in the Earth's atmosphere. It is lighter than air and therefore escapes Earth's gravity easier than other heavier gases.

Industrial uses

The most common use of hydrogen gas is in the petroleum and chemical industries. High concentrations of the gas are used to process fossil fuels and produce ammonia for fertilizer applications. Other industrial applications include its use as a coolant, a shielding gas in welding, a tracer gas for leak detection and within the semiconductor industry.

How we measure it

In the portable monitor range we measure hydrogen using a gas sensitive semiconductor (GSS) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPES		
								TEMP	RH	ENV	IAQ	IND
Hydrogen (H_2)	HA	GSS	0-5000	5	<±10 ppm + 10%	1	30	0 to 40°C	10 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

H_2S

Hydrogen Sulfide

Why measure it?

Hydrogen sulfide (H_2S) is a colorless, toxic gas which has a very distinct odor even at very low concentrations. The odor is very offensive and has a similarity to rotten eggs. In general, people exposed to such low concentrations of H_2S will not suffer health problems however it is still unpleasant due to the strong smell. An increase in H_2S levels can lead to eye irritation, nausea and shortness of breath. If concentrations continue to increase it can eventually damage the nervous system and result in death.

Where does it come from?

Natural sources

Hydrogen sulfide is formed as a result of bacterial breakdown of organic matter containing sulfur in the absence of oxygen. Natural sources include hot sulfur springs, lakes, swamps and volcanic gas. Human activity can increase the release of H_2S and due to its toxicity, concentrations should be closely monitored.

Industrial sources

The largest industrial source of hydrogen sulfide is in oil refining. It is also found in natural gas fields and must be separated and removed during the refining process. Other industrial sources include coke production, waste-water treatment plants, landfill sites, farms, and wood pulp production. H_2S odor is often considered a nuisance at industrial sites which are located close to built-up areas.

How we measure it

In the portable monitor range we measure hydrogen sulfide using a gas sensitive electrochemical (GSE) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Hydrogen sulfide (H_2S)	EHS	GSE	0-10	0.04	<±0.05 ppm 0-0.5 ppm <±10% 0.5-10 ppm	0.01	30	0 to 40°C	15 to 90%	✓	–	–
	EHT	GSE	0-100	0.4	<±0.5 ppm 0-5 ppm <±10% 5-100 ppm	0.1	30	0 to 40°C	15 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

Methane

Why measure it?

Methane (CH_4) is a non-toxic gas but extremely flammable and can form explosive mixtures with air. Its explosive limits are between 5 % (lower explosive limit) and 15 % (upper explosive limit) in air. In poorly ventilated areas it is important to ensure the concentration does not exceed safe levels. CH_4 displaces oxygen which could lead to asphyxia if leaks occur.

Where does it come from?

Natural sources

In the environment methane is found underground and below the sea floor where it is slowly released into the atmosphere. It is the main component of natural gas and therefore used as a fuel especially in electricity generation. In many cities it is also piped directly into homes and used for heating and cooking. When released into the atmosphere CH_4 is dispersed rapidly as it is lighter than air.

Industrial sources

The most common source of methane exposure is around landfill sites. CH_4 gas is produced naturally via a process called methanogenesis which is a form of anaerobic respiration used by organisms found at landfills. Landfill off-gas can penetrate the interiors of buildings built on or near landfills. Methanogenesis also occurs in ruminants, such as cattle, and therefore CH_4 concentrations can also be higher at cattle farms.

How we measure it

In the portable monitor range we measure methane using a gas sensitive semiconductor (GSS) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Methane (CH_4)	MT	GSS	0-10000	10	<±20 ppm + 15%	1	60	0 to 40°C	10 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

Nitrogen Dioxide

Why measure it?

Inhalation of nitrogen dioxide (NO_2) can impair lung function and increase susceptibility to infection, particularly in children. It can also aggravate asthma. NO_2 is not only a toxic gas but it is also a precursor to several harmful secondary air pollutants such as ozone and particulate matter. It also plays a role in the formation of acid rain and photochemical smog.

Where does it come from?

Natural sources

Nitrogen dioxide is not usually released directly into the air. NO_2 forms when nitric oxide (NO) and other nitric oxides (NO_X) react with other chemicals in the air. Some NO_2 is formed naturally in the atmosphere by lightning and some is produced by plants, soil and water.

As a pollutant

The major source of nitrogen dioxide in urban environments is the burning of fossil fuels. In urban areas this is most commonly associated with motor vehicle exhaust. Areas with high density road networks close to large populations such as in towns and cities are most at risk of over exposure. Industrial sites will also produce high concentrations of NO_2. These include any industry that use combustion processes such as power plants, electric utilities and industrial boilers.

How we measure it

In the portable monitor range we measure nitrogen dioxide using an electrochemical sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Nitrogen dioxide (NO_2)	ENW	GSE	0-1	0.005	<±0.02 ppm 0-0.2 ppm <±10% 0.2-1 ppm	0.001	30	0 to 40°C	15 to 90%	✓	–	–

*Refer to table on page 4 for sensor technology description.

Ozone

Why measure it?

In the upper atmosphere 'good' ozone (O_3) protects life on Earth from the sun's ultraviolet rays. At ground level 'bad' ozone is a criteria pollutant that is a significant health risk, especially for people with asthma. It also damages crops, trees and other vegetation and is a main component of smog.

Where does it come from?

Natural sources

Most ozone (about 90%) resides in a layer that begins between 6 and 10 miles (10 and 17 kilometers) above the Earth's surface and extends up to about 30 miles (50 kilometers). This region of the atmosphere is called the stratosphere. The O_3 in this region is commonly known as the ozone layer. Atmospheric turbulence and mixing of this layer into the lower troposphere results in a natural background concentration of about 0.03 to 0.04 ppm (30 to 40 ppb) of O_3 at ground level.

As a pollutant

Ground level ozone above the natural background is not emitted directly but is created by chemical reactions between the precursors; oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. The major sources of NOx and VOC are industrial facilities, vehicle exhaust, gasoline vapors, and chemical solvents. The O_3 reaction dynamics are such that concentrations are often highest downwind of the precursor sources and on the outskirts of urban areas.

Industrial uses

Ozone has found a range of industrial uses primarily as a disinfectant or sterilizing agent. It is used extensively in the food and beverage industry, water treatment, manufacturing, odor control, and sterilization in medical and domestic environments.

How we measure it

In the portable monitor range we measure ozone using either a gas sensitive semiconductor (GSS) sensor or a gas sensitive electrochemical sensor (GSE).*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Ozone (O_3)	OZU	GSS	0-0.15	0.001	<±0.005 ppm	0.001	60	0 to 40°C	10 to 90%	✓	✓	–
	OZL	GSS	0-0.5	0.001	<±0.008 ppm 0-0.1 ppm <±10% 0.1-0.5 ppm	0.001	60	0 to 40°C	10 to 90%	✓	✓	✓
	EOZ	GSE	0-10	0.01	<±0.01 ppm + 7.5%	0.01	60	0 to 40°C	15 to 90%	–	✓	✓

*Refer to table on page 4 for sensor technology description.

C_2Cl_4

Perchloroethylene

Why measure it?

Perchloroethylene (C_2Cl_4), which is also sometimes referred to as Tetrachloroethylene or PERC, is a colorless liquid. The liquid readily evaporates into the air and can be toxic to humans if inhaled. Health problems from exposure include headaches, irritation and neurological damage. Long term exposure can also result in various cancers forming in the body.

Where does it come from?

Industrial uses

Perchloroethylene is an effective chemical solvent used to dry clean clothes. Modern dry cleaning practices have resulted in a significant decrease in the concentration of C_2Cl_4 being used. However, due to the negative health effects caused by long term exposure, control and monitoring of C_2Cl_4 is still important in order to keep employees safe in these environments.

Perchloroethylene is also widely used to remove oil and oil-borne contaminants from objects that have undergone processes such as machining, welding and soldering. Modern vapor degreasing techniques have become common practice in the automotive and electronic manufacturing industries.

How we measure it

In the portable monitor range we measure perchloroethylene using a gas sensitive semiconductor (GSS) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Perchloroethylene (C_2Cl_4)	PE	GSS	0-200	1	<±5 ppm 0-50 ppm <±10% 50-200 ppm	1	30	0 to 40°C	10 to 90%	–	✓	✓

*Refer to table on page 4 for sensor technology description.

Sulfur Dioxide

Why measure it?

Sulfur dioxide (SO_2) is a toxic gas with a strong irritating smell. Inhaling sulfur dioxide has been associated with respiratory disease and difficulty breathing. It is also a precursor to acid rain and atmospheric particulates.

Where does it come from?

Natural sources

Sulfur dioxide is present at very low concentrations in the atmosphere and is naturally emitted during volcanic eruptions, as well as at geothermal sites.

As a pollutant

Fossil fuel combustion at power plants is the largest emission source of SO_2 into the atmosphere. Other sources include extracting metal from ore and the burning of high sulfur containing fuels by ships, trains and machinery. Perimeter monitoring at industrial sites is common to measure the concentration of SO_2 being emitted into the atmosphere.

Industrial uses

Sulfur dioxide is an intermediate component in the formation of sulfuric acid. Sulfuric acid is a very important commodity chemical used in several industrial processes including the fertiliser industry and metal treatments. SO_2 gas is also used directly in many industries. It acts as a preservative for dried fruits due to its antimicrobial properties and is used in wine making (in the form sodium bisulfite) to protect the wine from spoilage.

How we measure it

In the portable monitor range we measure sulfur dioxide using a gas sensitive electrochemical (GSE) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME (S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Sulfur dioxide (SO_2)	ESO	GSE	0-10	0.04	<±0.05 ppm 0-0.5 ppm <±10% 0.5-10 ppm	0.01	60	0 to 40°C	15 to 90%	✓	✓	–
	ESP	GSE	0-100	0.4	<±0.5 ppm 0-5 ppm <±10% 5-100 ppm	0.1	30	0 to 40°C	15 to 90%	–	–	✓

*Refer to table on page 4 for sensor technology description.

VOC

Volatile Organic Compounds

Why measure it?

Volatile organic compounds (VOCs) are carbon containing gases and vapors such as gasoline fumes and solvents. They evaporate easily at ordinary room temperature which is why they are termed volatile. Many VOCs such as benzene and formaldehyde are highly toxic and can cause cancer and other serious health problems. VOCs such as 1,3 butadiene are also involved in the formation of ground level ozone. The severity of the health effect depends largely on the type of organic compound present as well as the exposure time.

Where do they come from?

Natural sources

The largest source of VOCs is from vegetation however some compounds notably benzene are created during volcanic eruptions and forest fires. Although natural sources of VOC emissions are larger overall, anthropogenic sources are the main contributors of VOCs in urban areas.

As a pollutant

Anthropogenic sources include fuel production, distribution, and combustion. The largest emissions come from motor vehicles due to either evaporation or incomplete combustion of fuel, and from biomass burning.

Indoor sources

Typical indoor VOC sources include paint, cleaning supplies, furnishings, glues, permanent markers and printing equipment. Levels can be particularly high when ventilation is limited.

How we measure it

In the portable monitor range we measure VOC using either a photo-ionization detector (PID) or a gas sensitive semiconductor (GSS) sensor.*

Like all sensors in the portable monitor range the sensor benefits from active fan sampling and comes factory calibrated.

GAS	SENSOR CODE	SENSOR TYPE	RANGE (PPM)	MINIMUM DETECTION LIMIT (PPM)	ACCURACY OF FACTORY CALIBRATION	RESOLUTION (PPM)	RESPONSE TIME(S)	OPERATING CONDITIONS		APPLICATION TYPE		
								TEMP	RH	ENV	IAQ	IND
Volatile Organic Compound (VOC)	VM	GSS	0-25	0.1	<±0.1 ppm + 10%	0.1	60	0 to 40°C	10 to 90%	✓	✓	–
	VP	GSS	0-500	1	<±5 ppm + 10%	1	30	0 to 40°C	10 to 90%	–	–	✓
	PDL	PID	0-20	0.01	<±0.02 ppm + 10%	0.01	30	0 to 40°C	0 to 95%	✓	✓	–
	PDH	PID	0-2000	0.1	<±0.2 ppm + 10%	<1000 ppm: 0.1 >1000 ppm: 1	30	0 to 40°C	0 to 95%	–	–	✓

*Refer to table on page 4 for sensor technology description.

Maintenance & Calibration

Aeroqual portable monitors are designed for continuous use and require minimal maintenance and calibration.

Maintenance

	1 YEAR	2 YEARS
ACTIVITY	**Calibration** In order to maintain measurement accuracy, we recommend that sensor heads are re-calibrated on a yearly basis or more often if measurement certainty is critical for the application.	**Replacement** Every sensor has a finite life due to environmental exposure, chemical life and oxidation. To ensure continuous uninterrupted operation we recommend you plan for replacement of sensors at 2 years.
WHO	We recommend calibration is performed by the factory. Calibration can performed in the field with a Series 500 and suitable equipment.	Contact Aeroqual or an authorized representative.

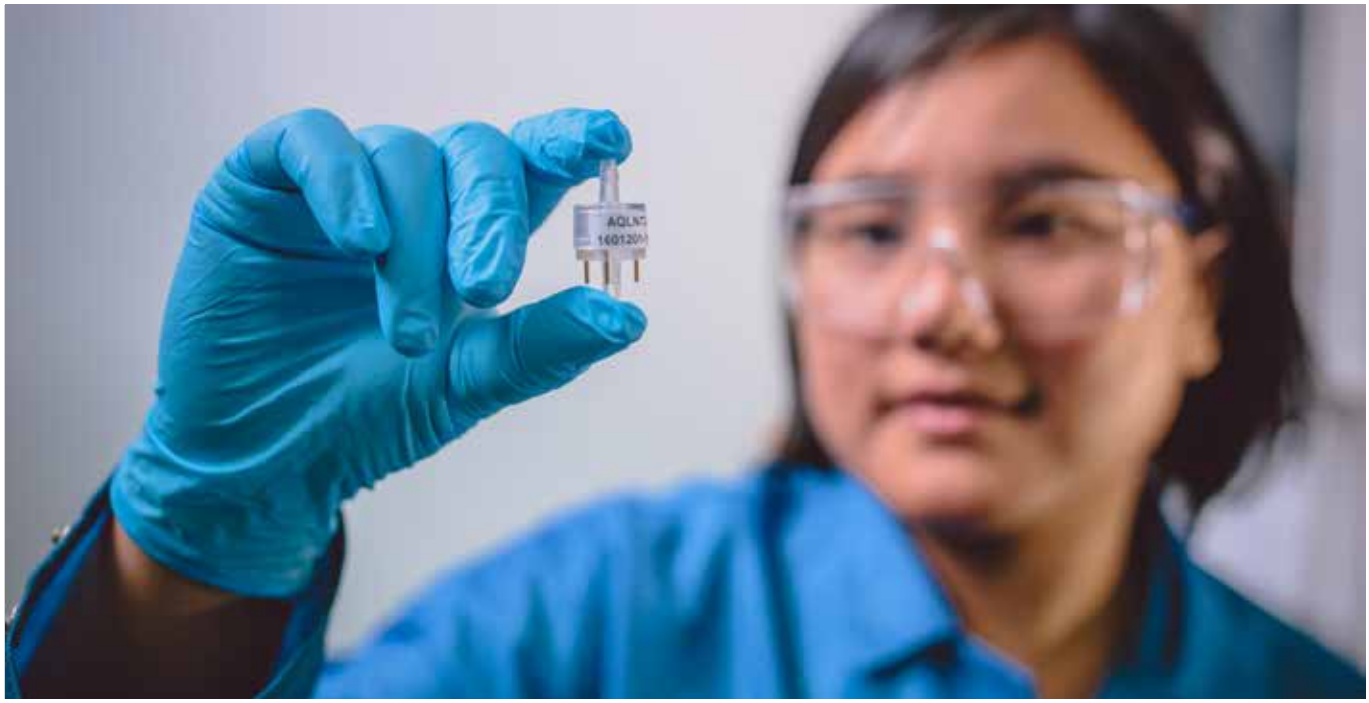
Calibration

Factory Calibration

Most of our sensors can have calibration performed in the field with a Series 500 and suitable equipment. Where this is not available, or for added assurance, we offer factory calibration.

Field Calibration

We offer a calibration accessory for field calibration. The calibration accessory is a simple and effective tool for calibrating sensor heads. By delivering a consistent flow of calibration gas to the sensor head, without forcing air at the sensor, it ensures the most accurate calibration possible. It can also be used to humidify the gas which is important for best results with GSS sensors.



Monitor bases

Aeroqual portable air quality monitors are a cost-effective solution to measure multiple target gases and particulate at different concentrations in indoor and outdoor applications. Use the guide below to identify a model suitable for your requirements.

Series 200

Series 300

Series 500

Which monitor do I need?

For real-time display measurements and zero calibration, the Series 200 is a cost effective solution. If an audible alarm or analogue output are required, along with the ability to make gain adjustments, choose the Series 300. For all these features and data logging, our flagship Series 500 is a clear choice.

Feature	Series 200	Series 300	Series 500
Simple to use, easy to maintain, multiple applications	✓	✓	✓
Interchangeable gas sensor heads	✓	✓	✓
Field replaceable long life Lithium battery (up to 8 hours)	✓	✓	✓
Minimum, maximum and average readings	✓	✓	✓
Zero calibration, gain adjustment	Zero Only	✓	✓
High and low alarms		✓	✓
Analog outputs (0-5V)		✓	✓
Data logging (Up to 8,188 records (2706 incl. temp/RH)			✓
Free desktop software (Series 500)			✓

Accessories

We offer a range of accessories to extend the functionality and applications of the portable monitors, and to protect them in dusty or wet environments.

Wall Bracket
AS R33

Calibration Kit
AS R42

Remote Sensor Kit
AS R10

IP41 Remote Sensor Kit
AS R13

Cigarette Lighter Adapter
AS R32

Lithiim Battery
AS R36

Industrial Enclosure
HH ENC

Carry Case Small
AS R40

Carry Case Large
AS R41

Other Products

Our ambient air monitoring product range spans portable and fixed instruments for spot checks and surveys, short and long term monitoring. The products have been designed to maximise accuracy and affordability, and are easy to deploy and easy to use. With a decade of experience making sensor-based air quality instruments, we are innovating and releasing new products at a rapid rate. Keep in touch with us to hear about the latest developments.

Dust Monitors

- Fixed instruments for outdoor ambient monitoring
- Laser-based detection allows real-time measurement
- Choose from TSP, PM_{10}, $PM_{2.5}$ and PM_1
- Optional wind, noise, weather sensors
- MCERTS certified Dust Sentry PM_{10}
- Applications: fenceline monitoring, roadside monitoring, air quality research, short term studies

MCERTS, a world first - Our Dust Sentry PM_{10} was the world's first nephelometer to pass the MCERTS indicative particle monitoring standard of the UK's Environment Agency.

AQS 1

- Fixed instruments for urban outdoor ambient monitoring
- Measure particulate matter (PM) and/or up to two gases simultaneously
- Particulate options: TSP, PM_{10}, $PM_{2.5}$ and PM_1
- Gas options: O_3, NO_2, VOC
- Optional wind, noise, weather sensors
- Applications: construction monitoring, roadside emissions, rail corridor and terminal emissions, mapping smog formation & distribution, validation of air quality models, community exposure studies

Air Quality Monitoring Systems

- 'Near Reference' multi-parameter monitoring
- Simultaneous measurement of gas, particulate, and environmental conditions (wind, noise, solar)
- Capable of monitoring to WHO requirements
- 1ppb detection of O_3, NO_2, NOx; <10ppb SO_2
- Optional integrated calibration
- Applications: national air monitoring networks, urban air monitoring, industrial fenceline monitoring, air quality research

MCERTS, Certified Product: Indicative Ambient Particulate Monitors.

Hi-Tech Awards, Winner: Innovative Hardware Award.

WINNER OF THE NZ HI-TECH AWARDS 2016

Just a handful of customers who chose Aeroqual:

aeroqual

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